PCT/AU2004/000947
Received 19 August 2005

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. [AMENDED] An optical filter having a passband of less than 1nm, said filter including a plurality of cavities, one or more of said cavities including a spacer of thickness greater than 7 µm, said spacer defining two opposed surfaces each having a plurality of thin layers disposed thereon, wherein the total number of thin layers per cavity is less than 35 and wherein the maximum allowable uniformity error in the thickness of each of said thin layers is within the range of 1 part in 50,000 to 3 parts in 1000.

2. [RENUMBERED] [PREVIOUS CLAIM 2 DELETED] An optical filter according to claim 1 wherein the thickness of the spacer is greater than 10 µm.

3. [RENUMBERED] An optical filter according to any one of the preceding claims wherein the thickness of the spacer is greater than 20 µm.

4. [RENUMBERED] An optical filter according to any one of the preceding claims wherein the thickness of the spacer is greater than 50 µm.

5. [RENUMBERED] An optical filter according to any one of the preceding claims wherein the thickness of the spacer is greater than 100 µm.

6. [RENUMBERED] An optical filter according to any one of the preceding claims wherein the average number of thin layers per cavity is less than 30.

7. [RENUMBERED] An optical filter according to any one of the preceding claims wherein the average number of thin layers per cavity is less than 25.

8. [RENUMBERED] An optical filter according to any one of the preceding claims wherein the average number of thin layers per cavity is less than 15.

9. [RENUMBERED] [PREVIOUS CLAIM 10 AND 11 DELETED} An optical filter according to any one of the preceding claims wherein said filter has a passband of less than 0.5nm.

10. [RENUMBERED] An optical filter according to any one of the preceding claims wherein said filter is adapted to receive a dense wavelength division multiplexed

PCT/AU2004/000947
Received 19 August 2005

optical signal including a plurality of channels within a predetermined frequency range.

11. [RENUMBERED] An optical filter according to claim 10 wherein said predetermined frequency range is approximately 1520nm to 1570nm.

12. [RENUMBERED] An optical filter according to any one of the preceding claims wherein at least one of the cavities is formed in accordance with the following formula:

(HL)^6 HMH (LH)^6

where H is a quarter wavelength layer of material having a refractive index of approximately 2.065, L is a quarter wavelength layer of material having a refractive index of approximately 1.465 and M is a spacer of approximately 21μm thickness and having an approximate refractive index of 1.465.

13. [RENUMBERED] An optical filter according to any one of the preceding claims wherein said optical filter is in accordance with the following formula:

((HL)^6 HMH (LH)^6 L)^3

where H is a quarter wavelength layer of material having a refractive index of approximately 2.065, L is a quarter wavelength layer of material having a refractive index of approximately 1.465 and M is a spacer of approximately 21μm thickness and having an approximate refractive index of 1.465.

14. [RENUMBERED] An optical filter according to claim 12 or 13 wherein the maximum allowable uniformity error in the thickness of each of said thin layers is within the range of 1 part in 50,000 to 4 parts in 10,000.

15. [RENUMBERED] An optical filter according to any one of the preceding claims wherein the maximum allowable absorption in each of said thin layers corresponds to an extinction coefficient of between 1×10^{-4} and 1×10^{-5}.

PCT/AU2004/000947
Received 19 August 2005

16. [RENUMBERED] An optical filter according to any one of the preceding claims wherein the maximum allowable uniformity error in the thickness of each of said spacers is less than or equal to 0.53nm.

17. [RENUMBERED] An optical filter according to any one of claims 1 to 11 wherein at least one of the cavities is formed in accordance with the following formula:

(HL)^4 HMH (LH)^4

where H is a quarter wavelength layer of material having a refractive index of approximately 2.065, L is a quarter wavelength layer of material having a refractive index of approximately 1.465 and M is a spacer of approximately 106μm thickness and having an approximate refractive index of 1.465.

18. [RENUMBERED] An optical filter according to any one of claims 1 to 11 wherein said optical filter is in accordance with the following formula:

((HL)^4 HMH (LH)^4 L)^3

where H is a quarter wavelength layer of material having a refractive index of approximately 2.065, L is a quarter wavelength layer of material having a refractive index of approximately 1.465 and M is a spacer of approximately 106μm thickness and having an approximate refractive index of 1.465.

19. [RENUMBERED] An optical filter according to claim 17 or 18 wherein said optical filter is used in combination with a blocking filter having a passband of approximately 12nm so as to block adjacent side orders.

20. [RENUMBERED] An optical filter according to any one of claims 17 to 19 wherein the maximum allowable uniformity error in the thickness of each of said thin layers is within the range of 1 part in 50,000 to 3 parts in 2,000.

21. [RENUMBERED] An optical filter according to any one of claims 1 to 11 wherein at least one of the cavities is formed in accordance with the following formula:

(HL)^4 HMH (LH)^4

PCT/AU2004/000947
Received 19 August 2005

where H is a quarter wavelength layer of material having a refractive index of approximately 2.065, L is a quarter wavelength layer of material having a refractive index of approximately 1.465 and M is a spacer of approximately 529μm thickness and having an approximate refractive index of 1.465.

22. [RENUMBERED] An optical filter according to any one of claims 1 to 11 wherein said optical filter is in accordance with the following formula:

((HL)^4 HMH (LH)^4 L)^3

where H is a quarter wavelength layer of material having a refractive index of approximately 2.065, L is a quarter wavelength layer of material having a refractive index of approximately 1.465 and M is a spacer of approximately 529μm thickness and having an approximate refractive index of 1.465.

23. [RENUMBERED] An optical filter according to claim 21 or 22 wherein said optical filter is used in combination with a blocking filter having a passband of approximately 2.4nm so as to block adjacent side orders.

24. [RENUMBERED] An optical filter according to any one of claims 21 to 23 wherein said filter has a passband of less than 0.05nm.

25. [RENUMBERED] An optical filter according to any one of claims 21 to 24 wherein the maximum allowable uniformity error in the thickness of each of said thin layers is within the range of 1 part in 50,000 to 1.2 parts in 1,000.

26. [RENUMBERED] An optical filter according to any one of claims 21 to 25 wherein the maximum allowable uniformity error in the thickness of each of said spacers is less than or equal to 1.6nm.

27. [RENUMBERED] An optical filter according to any one of claims 1 to 11 wherein said optical filter is in accordance with the following formula:

(HL)^2 HMH (LH)^2 L ((HL)^3 HMH (LH)^3 L)^2 (HL)^2 HMH (LH)^2

where H is a quarter wavelength layer of material having a refractive index of approximately 2.065, L is a quarter wavelength layer of material having a refractive index of

PCT/AU2004/000947
Received 19 August 2005

index of approximately 1.465 and M is a spacer of approximately 1.32mm thickness and having an approximate refractive index of 1.465.

28. [RENUMBERED] An optical filter according to claim 27 wherein said optical filter is used in combination with a blocking filter having a passband of approximately 1nm so as to block adjacent side orders.

29. [RENUMBERED] [PREVIOUS CLAIM 32 DELETED] An optical filter according to any one of claims 27 to 28 wherein the maximum allowable uniformity error in the thickness of each of said spacers is less than or equal to 3.96nm.

30. [RENUMBERED] An optical filter according to any one of claims 1 to 11 wherein said optical filter is in accordance with the following formula:

((HL)^7 HMH (LH)^7 L) ((HL)^8 HMH (LH)^8 L)^2 ((HL)^7 HMH (LH)^7)

where H is a quarter wavelength layer of material having a refractive index of approximately 2.065, L is a quarter wavelength layer of material having a refractive index of approximately 1.465 and M is a spacer of approximately 0.8mm thickness and having an approximate refractive index of 1.465.

31. [RENUMBERED] An optical filter according to claim 30 wherein the maximum allowable uniformity error in the thickness of each of said thin layers is within the range of 1 part in 50,000 to 1 part in 10,000.

32. [RENUMBERED] An optical filter according to any one of claims 30 or 31 wherein the maximum allowable uniformity error in the thickness of each of said spacers is less than or equal to 0.11nm.

33. [RENUMBERED] An optical filter according to any one of claims 30 to 32 wherein said filter has a passband of approximately 0.002nm.

34. [RENUMBERED AND AMENDED] [PREVIOUS CLAIM 38 DELETED] An optical interleaver having a passband of less than 1nm, the interlever including a plurality of cavities, one or more of said cavities including a spacer of thickness greater than 7 μm, said spacer defining two opposed surfaces each having a plurality of thin layers disposed thereon, wherein the average number of thin layers per cavity is less than

PCT/AU2004/000947
Received 19 August 2005

35 and wherein the maximum allowable uniformity error in the thickness of each of the thin layers is within the range of 1 part in 50,000 to 3 parts in 1000.

35. [RENUMBERED] [PREVIOUS CLAIM 40 DELETED] An optical interleaver according to claim 34 wherein the average number of thin layers per cavity is less than 30.

36. [RENUMBERED] An optical interleaver according to claim 34 or 35 wherein the thickness of the spacer is greater than 10 μm.

37. [RENUMBERED] An optical interleaver according to claim 34 or 35 wherein the thickness of the spacer is greater than 20 μm.

38. [RENUMBERED] An optical interleaver according to claim 34 or 35 wherein the thickness of the spacer is greater than 50 μm.

39. [RENUMBERED] An optical interleaver according to claim 34 or 35 wherein the thickness of the spacer is greater than 100 μm.

40. [RENUMBERED] An optical interleaver according to any one of claims 34 to 39 wherein the total number of thin layers per cavity is less than 25.

41. [RENUMBERED] An optical interleaver according to any one of claims 34 to 39 wherein the total number of thin layers per cavity is less than 15.

42. [RENUMBERED] An optical interleaver according to any one of claims 34 to 39 wherein the total number of thin layers per cavity is less than 10.

43. [RENUMBERED] [PREVIOUS CLAIMS 49, 50 AND 51 DELETED] An optical interleaver according to any one of claims 34 to 42 wherein each of said channels has a bandwidth of less than 0.5μm.

44. [RENUMBERED] [PREVIOUS CLAIM 53 DELETED] An optical interleaver according to any one of claims 34 to 43 wherein at least one of the cavities is formed in accordance with the following formula:

HLHM

PCT/AU2004/000947
Received 19 August 2005

where H is a quarter wavelength layer of material having a refractive index of approximately 2.065, L is a quarter wavelength layer of material having a refractive index of approximately 1.465 and M is a spacer of approximately 0.8mm thickness and having an approximate refractive index of 1.465.

45. [RENUMBERED] An optical interleaver according to any one of claims 34 to 44 wherein said interleaver is formed in accordance with the following formula:

(HLHM)^10 HLH

where H is a quarter wavelength layer of material having a refractive index of approximately 2.065, L is a quarter wavelength layer of material having a refractive index of approximately 1.465 and M is a spacer of approximately 0.8mm thickness and having an approximate refractive index of 1.465.

46. [RENUMBERED] An optical interleaver according to any one of claims 34 to 45 wherein the maximum allowable uniformity error in the thickness of each of said thin layers is equal to or less than 5nm.

47. [RENUMBERED] An optical interleaver according to any one of claims 34 to 46 wherein the maximum allowable uniformity error in the thickness of each of said spacers is equal to or less than 8nm.

48. [RENUMBERED AND AMENDED] An optical interleaver adapted to receive a dense wavelength division multiplexed optical input signal including a plurality of channels ranging in frequency between approximately 1520nm and 1570nm, said interleaver being adapted to split said input into an output of at least two sub-sets of channels, wherein each channel has a bandwidth of less than 1nm, said interleaver having a plurality of cavities, one or more of said cavities including a spacer of thickness greater than 7 μm and wherein said spacer defines two opposed surfaces each having a plurality of thin layers disposed thereon, wherein the average number of thin layers per cavity is less than 35 and wherein the maximum allowable uniformity error in the thickness of each of said thin layers is within the range of 1 part in 50,000 to 3 parts in 1000.

PCT/AU2004/000947
Received 19 August 2005

49. [RENUMBERED AND AMENDED] A method of manufacturing an optical filter in accordance with any one of claims 1 to 33, said method including the steps of:

producing a plurality of spacers by optically polishing a substrate, wherein at least one of said spacers has a thickness of greater than 7μm;

using thin film deposition to deposit a plurality of thin layers onto each of said spacers to form cavities, whereby the average number of thin layers per cavity is less than 35 and wherein the maximum allowable uniformity error in the thickness of each of said thin layers is within the range of 1 part in 50,000 to 3 parts in 1000; and

optically contacting said plurality of cavities to form said filter.

50. [RENUMBERED AND AMENDED] A method of manufacturing an optical filter in accordance with any one of claims 1 to 33, said method including the steps of:

a) utilising thick film deposition to produce a spacer having a thickness of greater than 7μm;

b) utilising thin film deposition to deposit a plurality of thin layers onto said spacer to form a cavity, the average number of thin layers per cavity being less than 35 and wherein the maximum allowable uniformity error in the thickness of each of said thin layers is within the range of 1 part in 50,000 to 3 parts in 1000; and

c) repeating combinations of steps a) and b) so as to form said filter.

51. [RENUMBERED AND AMENDED] A method of manufacturing an optical interleaver in accordance with any one of claims 34 to 48, said method including the steps of:

producing a plurality of spacers by optically polishing a substrate, wherein at least one of said spacers has a thickness of greater than 7μm;

using thin film deposition to deposit a plurality of thin layers onto each of said spacers to form cavities, whereby the average number of thin layers per cavity is less than 35 and wherein the maximum allowable uniformity error in the thickness of each of said thin layers is within the range of 1 part in 50,000 to 3 parts in 1000; and

PCT/AU2004/000947
Received 19 August 2005

optically contacting said plurality of cavities to form said interleaver.

52. [RENUMBERED AND AMENDED] A method of manufacturing an optical interleaver in accordance with any one of claims 34 to 48, said method including the steps of:

a) utilising thick film deposition to produce a spacer having a thickness of greater than 7μm;

b) utilising thin film deposition to deposit a plurality of thin layers onto said spacer to form a cavity, the average number of thin layers per cavity being less than 35 and wherein the maximum allowable uniformity error in the thickness of each of said thin layers is within the range of 1 part in 50,000 to 3 parts in 1000; and

c) repeating combinations of steps a) and b) so as to form said interleaver.